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*Original Research Article*

# ALTERATIONS IN THE PARAMETERS OF CONVENTIONAL LIVER FUNCTION TESTS IN LIVER DISEASE AND NON-LIVER DISEASE: DOES IT INDICATE THE REQUIREMENT OF NEWER PARAMETERS?

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**ABSTRACT**

**Background:** The present study was carried out to evaluate the alterations in the levels of Conventional Liver Function Tests (CLFTs) in liver disease patients and to differentiate it from non-liver disease. **Material and method:** This cross-sectional study was conducted at Sir T Hospital in 50 liver disease patients and 50 non-liver disease patients, who were examined clinically and confirmed sonographically for liver involvement. Out of 50 liver disease patients, 17 had cirrhosis and 17 were of chronic hepatitis mainly. All the parameters of CLFTs including serum bilirubin, SGPT, SGOT, ALP, Total protein and albumin were estimated and compared in liver disease and non-liver disease patients. ***Results:*** Data was analyzed by non-parametric Mann-Whitney test and statistical significance was calculated. It showed that serum bilirubin was highly significant ($p<0.001$), while SGPT and SGOT were raised in liver disease patients, but they were not statistically significant ($p>0.05$). All the parameters of CLFTs were lacking the sensitivity and specificity to correctly diagnose liver involvement. It was also observed that all the parameters of CLFTs were also altered in many non-liver disease patients. So none of the individual test can predict the liver disease and at times it can lead to a confusing situation between liver disease and non-liver disease. ***Conclusion:*** The present study concludes that more sensitive and specific parameters are needed to correctly diagnose liver disease and at the same time it must rule out non-liver diseases.

**Keywords:** Conventional Liver Function Tests, Liver disease, Non-liver disease.

## INTRODUCTION

Liver is a complex, unique and largest internal organ of the human body serving many functions crucial to sustain life. Liver has a broad spectrum of functions, therefore diseases causing hepatic impairment have repercussions throughout the body. Hepatocyte injury is common worldwide. Liver diseases are usually classified as hepatocellular, cholestatic or mixed diseases. In hepatocellular diseases, features of liver injury, inflammation, and necrosis predominate. In cholestatic diseases, features of inhibition of bile flow predominate and in a mixed pattern, features of both hepatocellular and cholestatic injury are present **(1) (2)**.

Conventional liver function tests (CLFTs) include serum bilirubin, alanine aminotransferase (ALT, SGPT), aspartate aminotransferase (AST, SGOT), alkaline phosphatase (ALP), total protein and albumin. They are commonly used to define the pattern of liver disease, assessment of the severity and for follow up purposes. The CLFTs may be normal in certain liver diseases and they are also not specific for liver disease, because all the parameters of CLFTs may be elevated for pathological processes outside the liver **(3) (4).**

A number of pitfalls can be encountered in the interpretation of CLFTs. Normal CLFTs do not always mean that the liver is normal. These tests can be normal in

patients with chronic hepatitis or cirrhosis **(5).** Therefore, none of the individual test amongst CLFTs is of much importance in diagnosis of liver diseases, however when many of the liver function tests are abnormal at the same time, liver disease is the most probable diagnosis.

The present study was aimed to find out the alterations in the parameters of CLFTs in liver diseases and non-liver diseases and also to evaluate that whether these parameters are sufficient enough to diagnose liver disease or there is requirement of more sensitive and specific parameter to diagnose liver disease.

## METHODS

This study was carried out on 50 liver disease and 50 non-liver disease patients, who were selected from various wards of Sir T Hospital, Bhavnagar, Gujarat. All liver disease patients were primarily evaluated by clinical examination and then confirmed sonographically for liver involvement. Amongst these, 17 patients were of cirrhosis and 17 were of chronic viral hepatitis C, while remaining 16 patients were of liver carcinoma. Non-liver disease patients were mostly presented with minor ailments or infections and liver involvement was ruled out in them by ultrasonography. All the patients were aged between 15-65 years and mean age was 44 years in liver disease and 43 years in non-liver disease patients. All patients were explained fully about the study and written informed consent was obtained from them. The study was approved by Institutional Review Board and Human Ethics Committee.

Blood was collected by venepuncture from each patient and serum was separated from clotted blood by centrifugation. Estimations of serum bilirubin, SGPT, SGOT, ALP, total protein and albumin were done in all serum samples. All the enzymes were detected by kinetic methods and bilirubin, total protein and albumin were detected by end-point methods **(6).** All analyses were done on full auto analyzer – Miura (ISE, Italy).

The results were analyzed by non-parametric Mann-Whitney test. Statistical significance (p-value) was obtained and compared in liver disease and non-liver disease patients. Sensitivity and specificity of all the parameters were detected and were compared in both the groups. International Biorad Internal Quality Controls (Level I & II) were run for all the parameters prior running patients' samples.

## RESULTS

Table 1 shows the mean, standard deviation and statistical significance (p-value) of serum total bilirubin, SGPT, SGOT, ALP, total protein and albumin in liver disease and non-liver disease patients. Amongst all the parameters of CLFTs, serum bilirubin was highly significant statistically, while SGPT and SGOT were found elevated but were not significant statistically. Even in non-liver disease patients, the levels of SGPT and SGOT were elevated.

Table 2 shows the sensitivity, specificity, positive predictive value and negative predictive value of various parameters of CLFTs to diagnose liver disease. Sensitivity of SGOT was maximum (90%), but it was least specific (18%) for liver involvement.

**Table 1. Conventional liver function tests in liver disease (LD) and non-liver disease (NLD) patients.**

| ***Parameter*** | ***Biological Reference Interval*** | ***LD Patients (n=50) Mean±SD*** | ***NLD Patients (n=50) Mean±SD*** | ***Statistical Significance p-value*** |
|---|---|---|---|---|
| Total Bilirubin (µmol/L) | Upto 18.8 | 109.4 ± 94 | 15.4 ± 5.1 | 0.001 |
| SGPT (IU/L) | 0-45 | 163 ± 369 | 78 ± 58 | 0.45 |
| SGOT (IU/L) | 0-35 | 121 ± 150 | 79 ± 63 | 0.09 |
| ALP (IU/L) | 98-279 | 346 ± 189 | 255 ± 115 | 0.02 |
| Total Protein (g/L) | 66-83 | 60 ± 8 | 63 ± 12 | 0.01 |
| Albumin (g/L) | 35-50 | 29 ± 6 | 33 ± 6 | 0.01 |

Statistical analysis was done by Mann-Whitney test

**Table 2. Sensitivity, specificity, positive predictive value and negative predictive value of CLFTs in liver disease.**

| | Total Bilirubin | SGPT | SGOT | ALP | Total Protein | Albumin |
|---|---|---|---|---|---|---|
| **Sensitivity (%)** | 88 | 72 | 90 | 56 | 86 | 78 |
| **Specificity (%)** | 76 | 72 | 18 | 74 | 42 | 50 |
| **Positive Predictive Value (%)** | 78 | 50 | 52 | 68 | 60 | 61 |
| **Negative Predictive Value (%)** | 86 | 72 | 64 | 63 | 75 | 69 |

## DISCUSSION

Amongst all the parameters of CLFTs, serum bilirubin was highly significant statistically, while SGPT and SGOT were found elevated but were not significant statistically. Even in non-liver disease patients, the levels of SGPT and SGOT were elevated. Such patients may be mistaken for liver disease patients and treated for the same for no reason. The results of this study has supported the data of the study carried out by M. G. Khan, who reported that many patients of moderate to severe liver diseases can have normal transaminases levels **(7).**

It clearly states that no single parameter of CLFTs is sensitive and specific enough to correctly diagnose liver disease. Sensitivity of SGOT was maximum (90%), but it was least specific (18%) for liver involvement. Although all the patients were confirmed for liver involvement by ultrasonography, but none of the individual test of CLFTs can correctly predict the liver disease. This can create a state of confusion in clinicians' mind that whether liver is involved or not and thus there is always a scope for performing more diagnostic tests to rule out liver disease. This can increase the healthcare costs and suffering to the patients. Many studies concluded that the effectiveness of CLFTs is of limited diagnostic value when used alone **(3) (8).**

Amongst CLFTs, bilirubin was highly significant and its sensitivity (88%) and specificity (76%) was also higher than other parameters. Bilirubin is formed by enzymatic breakdown of heme in reticuloendothelial cells and its level can be increased in any hemolytic disease without involvement of liver **(5).** In the present study, only 28 patients out of 50 liver disease patients had elevated alkaline phosphatase activity. Different isoenzyme forms of alkaline phosphatase are found in many locations throughout the body, including bone, small intestine, kidney, placenta and white blood cells **(9).** Albumin and globulins except immunoglobulins are produced in liver, so total protein estimation may not be helpful to identify liver disease. Only 29 out of 50 liver disease patients had lower total protein levels. Similarly, serum albumin levels were also low in many non-liver disease patients. Albumin levels can be normal in some liver diseases **(10).** So, no single parameter amongst LFTs can rule out liver disease.

## CONCLUSION

In conclusion, present study demonstrates that routinely used CLFTs are not sensitive and specific enough to correctly diagnose liver disease. Some vital parameters of CLFTs might be altered in many non-liver diseases and there may be chances of normal CLFTs in many liver diseases also, thus it creates a dilemma in clinicians' mind to rule out liver disease from non-liver disease. Commonly performed serum liver enzymes are also of limited value in diagnosis and monitoring of liver diseases. Development and application of laboratory tests that can identify liver disease at the earliest have the potential of reducing the healthcare costs and suffering associated with liver diseases.

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